# Automating Blender with Python

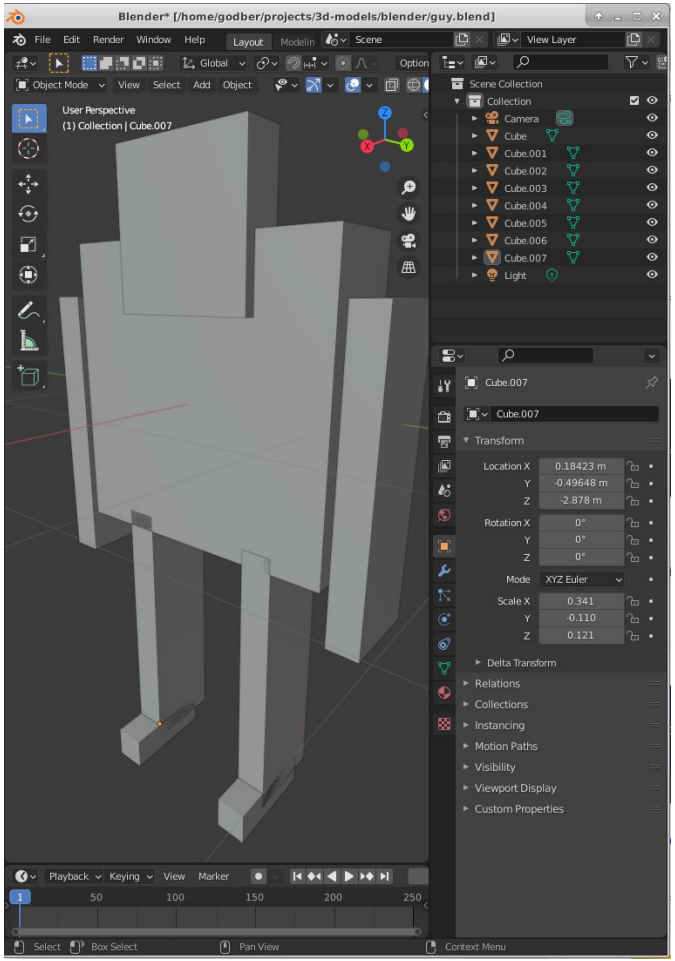
Austin Godber

May 2021

DesertPy

# First off, what does Blender do?

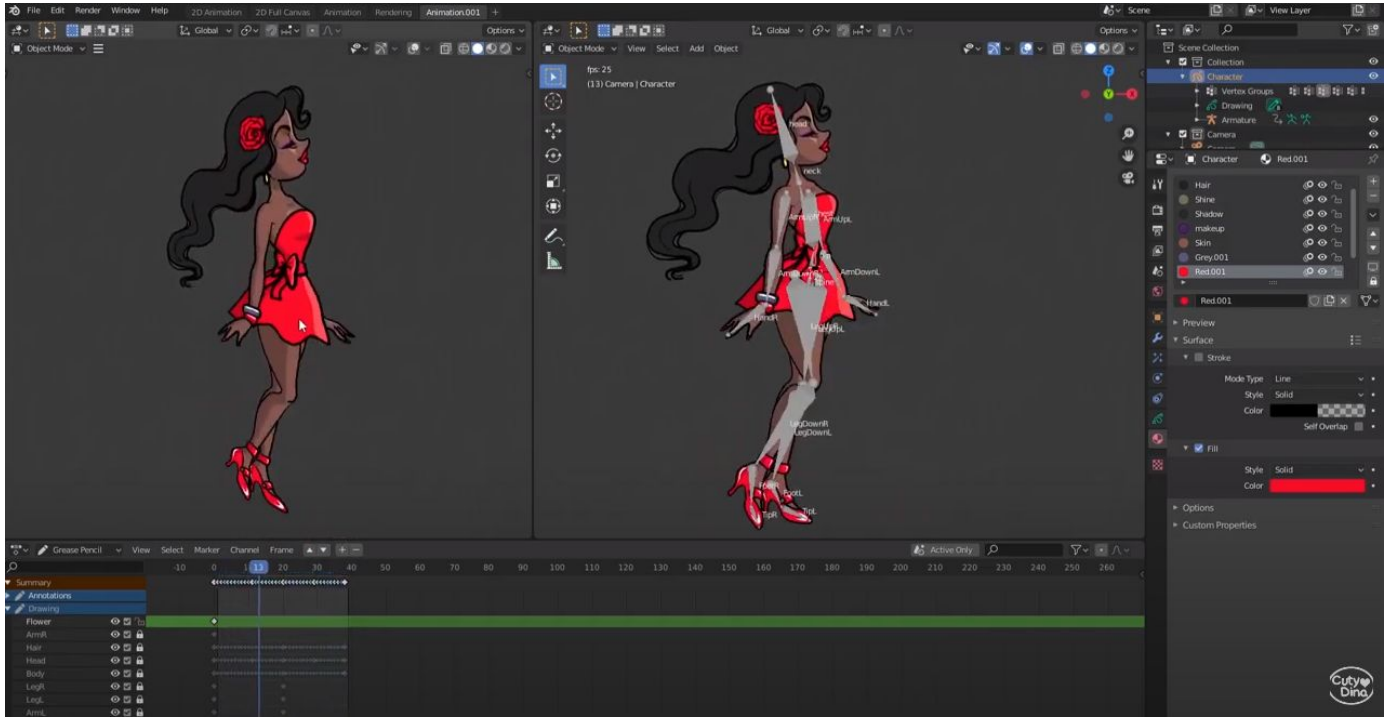
- 3D Modelling & Animation
- 2D Animation
- Visual Effects
- Video Editing
- Much more



# Blender: 3D Modelling

Source: Blender Guru - https://www.youtube.com/watch?v=TPrnSACiTJ4&t=187s

# Blender: 2D Animation

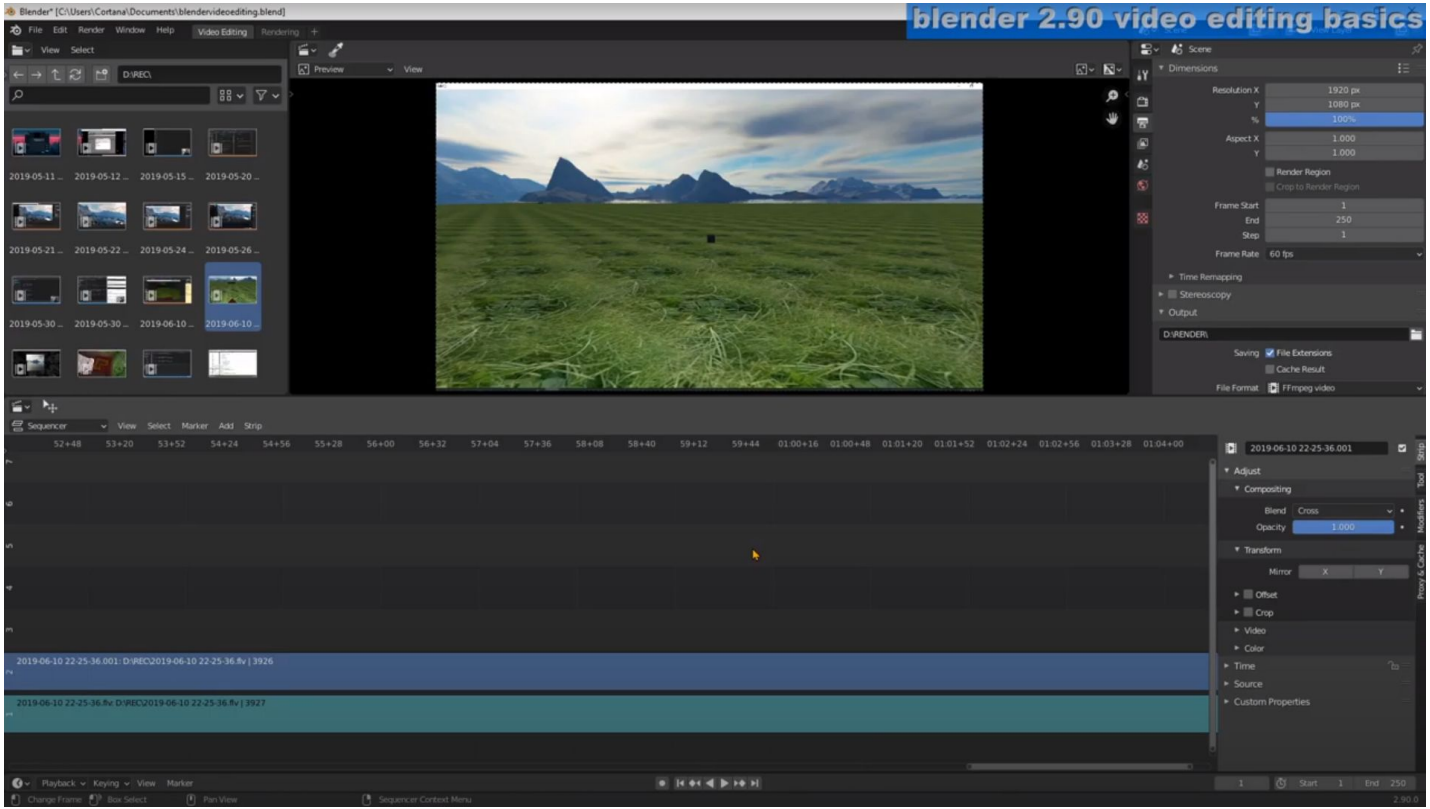



Source: Cuty Dina https://www.youtube.com/watch?v=C5FIsONz_zM

# Blender: Visual Effects

Source: Ian Hubert - https://www.youtube.com/watch?v=FFJ_THGj72U&t=52s

# Blender: Video Editing




Source: Code, Tech and Tutorials - https://www.youtube.com/watch?v=OtoM5b7i5z0

# What does this have to do with Python?

- Python is built in as it’s main scripting language.
- Many of the plugins are written in Python.
- Python is very well integrated and exposed through the UI, which makes using it easier.
- Maybe there are surprising things you can do with this.

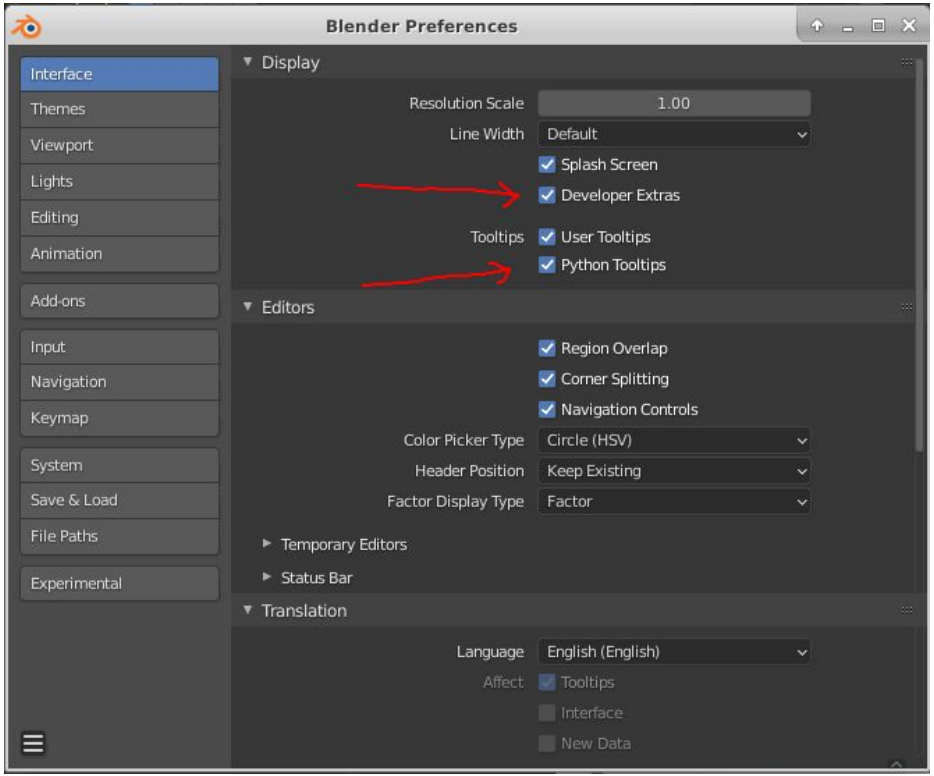
# Blender Python Features

- Edit any data the user interface can (Scenes, Meshes, Particles etc.).
- Modify user preferences, keymaps and themes.
- Run tools with own settings.
- Create user interface elements such as menus, headers and panels.
- Create new tools.
- Create interactive tools.
- Create new rendering engines that integrate with Blender.
- Subscribe to changes to data and it’s properties.
- Define new settings in existing Blender data.
- Draw in the 3D Viewport using Python.

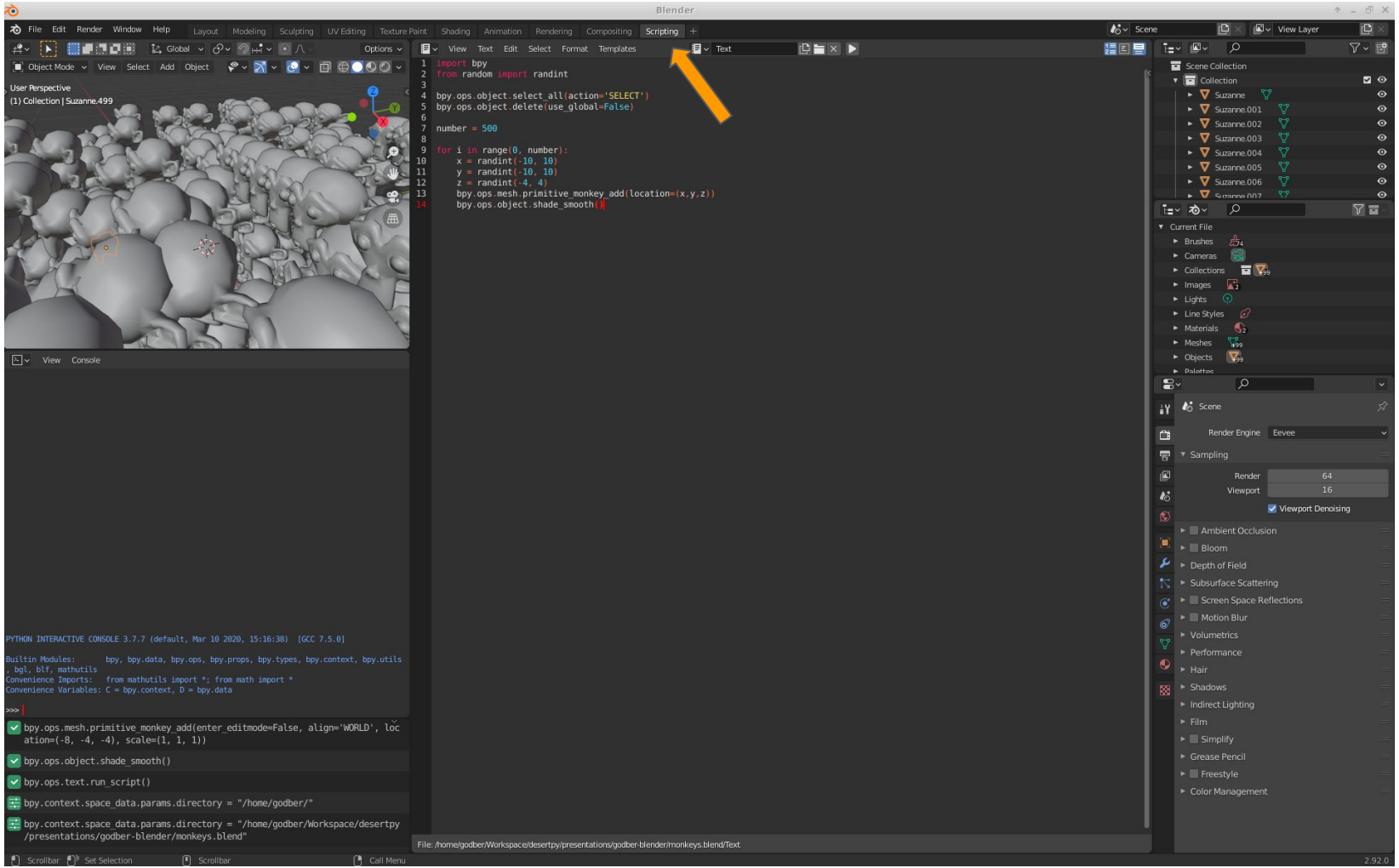
Source: https://docs.blender.org/api/current/info_quickstart.html

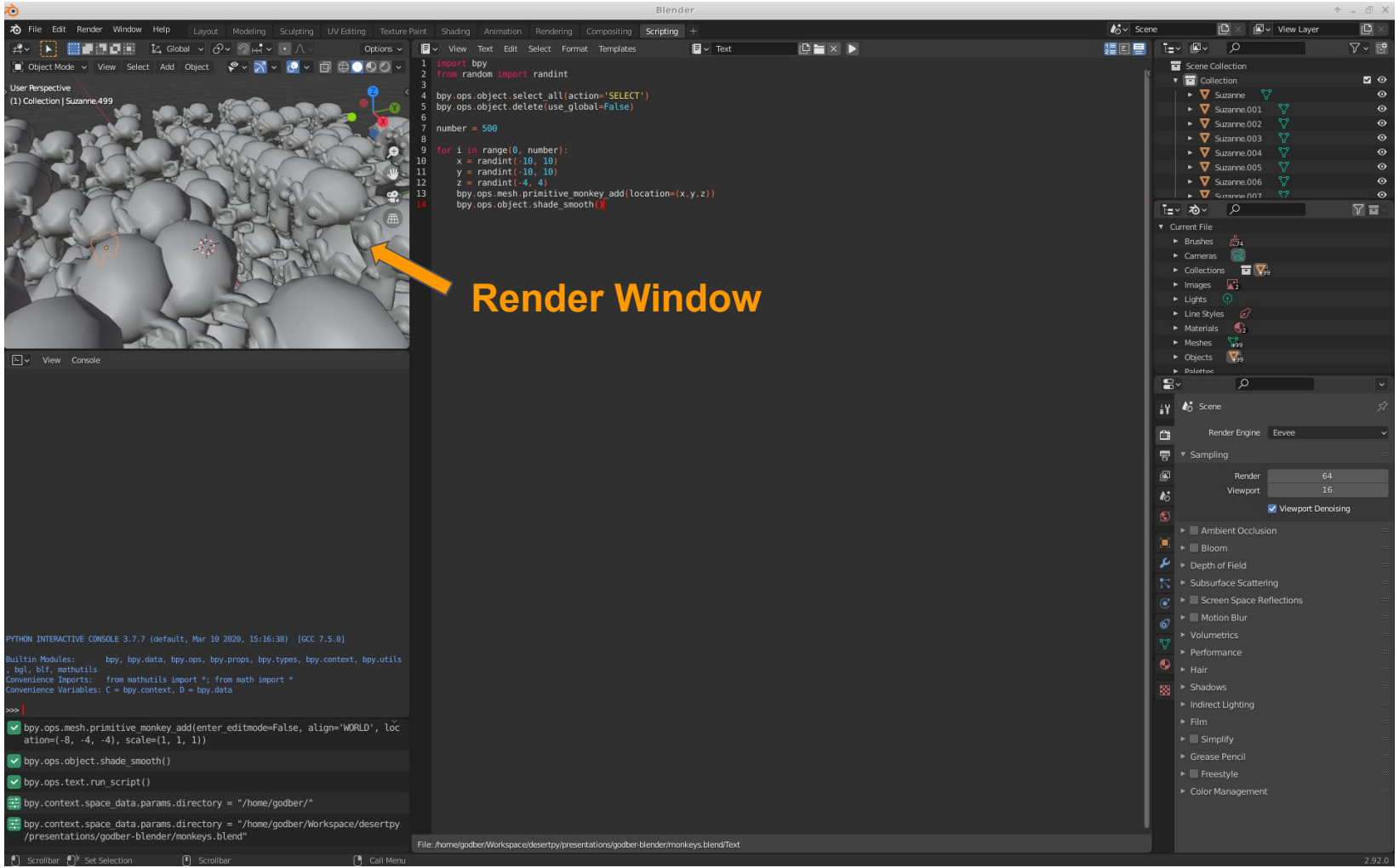
# Blender Python Tips

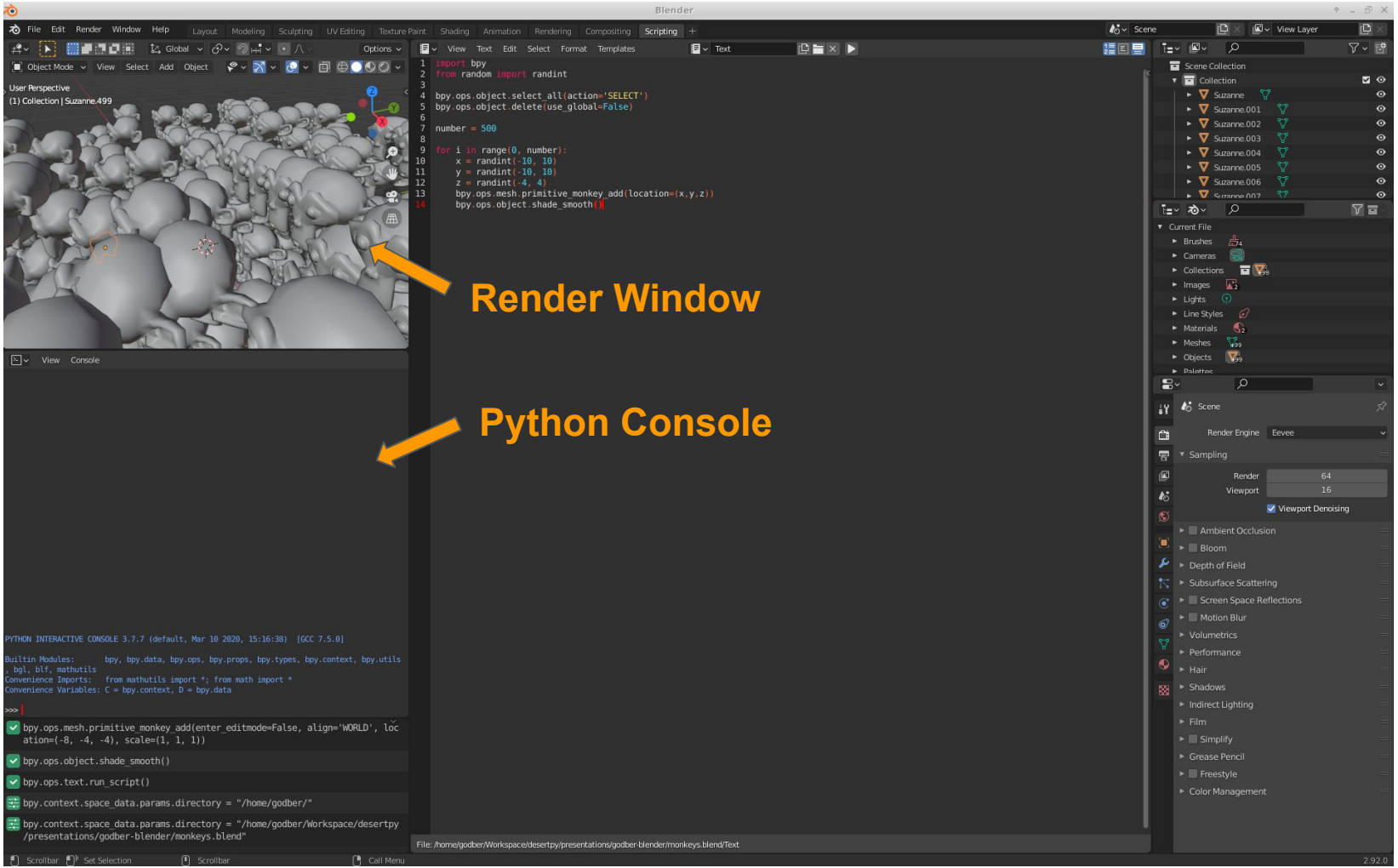
- Enable Developer Extras
- Enable Python Tooltips
  - Now you can see python function names in many “On Hover” info boxes.
- Start Blender from Terminal if possible, so you can see the python errors. YMMV.
- Use the latest blender (>2.9), download from their site if needed.
- Use the scripting mode.

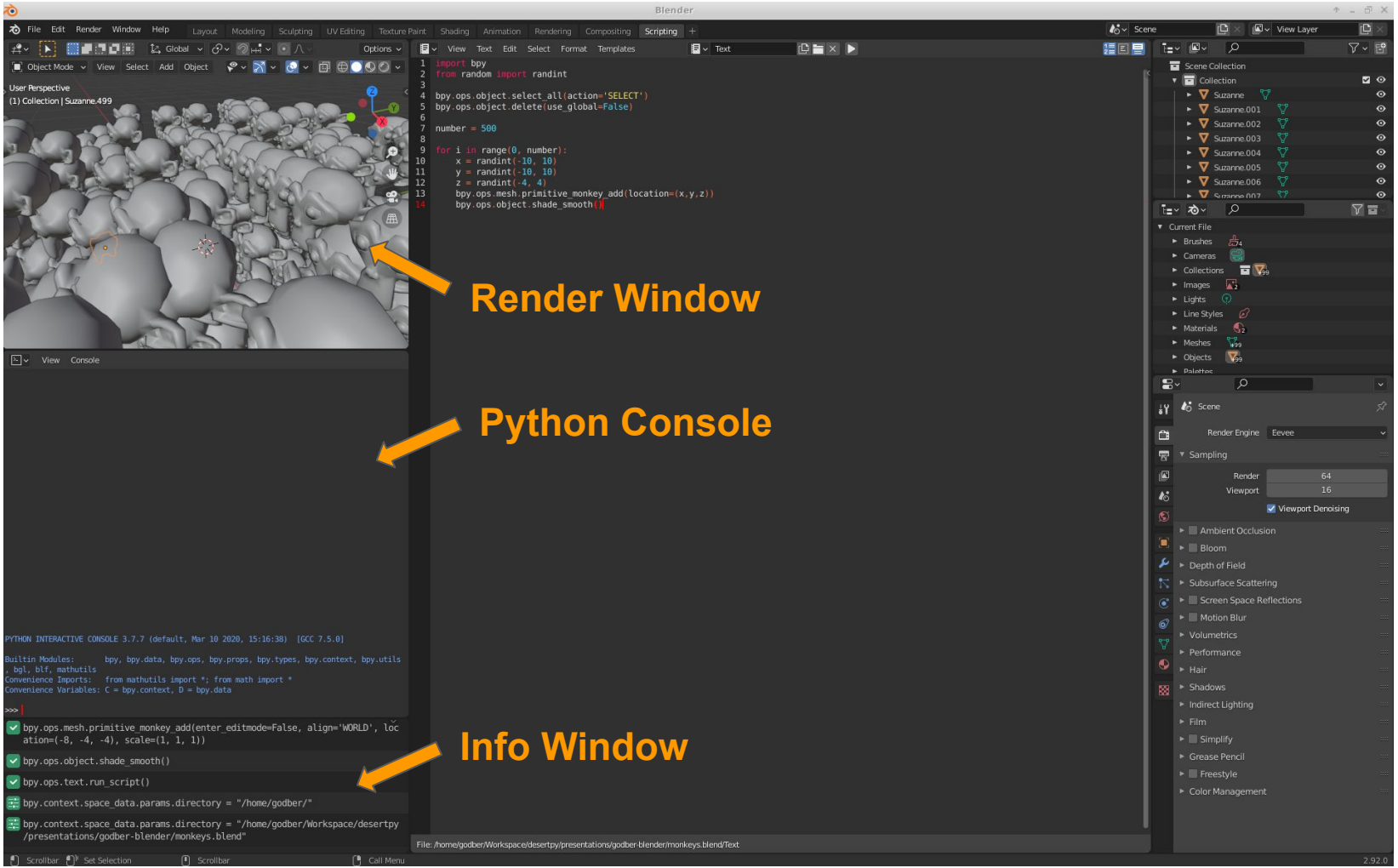


# Use The Scripting Window


Blender
File Edit Render Window Help
Layout Modeling Sculpting UV Editing Texture Paint Shading Animation Rendering Compositing Scripting
Scene
View Layer
Object Mode View Select Add Object
Global
Options
User Perspective
(1) Collection | Suzanne.499
View Text Edit Select Format Templates
Text
import bpy
from random import randint
bpy.ops.object.select_all(action='SELECT')
bpy.ops.object.delete(use_global=False)
number = 500
for i in range(0, number):
x = randint(-10, 10)
y = randint(-10, 10)
z = randint(-4, 4)
bpy.ops.mesh.primitive_monkey_add(location=(x,y,z))
bpy.ops.object.shade_smooth()
Scene Collection
Collection
Suzanne
Suzanne.001
Suzanne.002
Suzanne.003
Suzanne.004
Suzanne.005
Suzanne.006
Current File
Brushes
Cameras
Collections
Images
Lights
Line Styles
Materials
Meshes
Objects
Scene
Render Engine Eevee
Sampling
Render 64
Viewport 16
Viewport Denoising
Ambient Occlusion
Bloom
Depth of Field
Subsurface Scattering
Screen Space Reflections
Motion Blur
Volumetrics
Performance
Hair
Shadows
Indirect Lighting
Film
Simplify
Grease Pencil
Freestyle
Color Management
View Console
PYTHON INTERACTIVE CONSOLE 3.7.7 (default, Mar 10 2020, 15:16:38) [GCC 7.5.0]
Builtin Modules: bpy, bpy.data, bpy.ops, bpy.props, bpy.types, bpy.context, bpy.utils, bgl, blf, mathutils
Convenience Imports: from mathutils import *; from math import *
Convenience Variables: C = bpy.context, D = bpy.data
>>>
bpy.ops.mesh.primitive_monkey_add(enter_editmode=False, align='WORLD', location=(-8, -4, -4), scale=(1, 1, 1))
bpy.ops.object.shade_smooth()
bpy.ops.text.run_script()
bpy.context.space_data.params.directory = "/home/godber/"
bpy.context.space_data.params.directory = "/home/godber/Workspace/desertpy/presentations/godber-blender/monkeys.blend"
File: /home/godber/Workspace/desertpy/presentations/godber-blender/monkeys.blend/Text
Scrollbar Set Selection Scrollbar Call Menu
2.92.0


Blender
File Edit Render Window Help
Layout Modeling Sculpting UV Editing Texture Paint Shading Animation Rendering Compositing Scripting
Scene
View Layer
Object Mode View Select Add Object
Global
Options
User Perspective
(1) Collection | Suzanne.499
View Text Edit Select Format Templates
Text
import bpy
from random import randint
bpy.ops.object.select_all(action='SELECT')
bpy.ops.object.delete(use_global=False)
number = 500
for i in range(0, number):
x = randint(-10, 10)
y = randint(-10, 10)
z = randint(-4, 4)
bpy.ops.mesh.primitive_monkey_add(location=(x,y,z))
bpy.ops.object.shade_smooth()
Render Window
Scene Collection
Collection
Suzanne
Suzanne.001
Suzanne.002
Suzanne.003
Suzanne.004
Suzanne.005
Suzanne.006
Current File
Brushes
Cameras
Collections
Images
Lights
Line Styles
Materials
Meshes
Objects
Scene
Render Engine
Eevee
Sampling
Render
64
Viewport
16
Viewport Denoising
Ambient Occlusion
Bloom
Depth of Field
Subsurface Scattering
Screen Space Reflections
Motion Blur
Volumetrics
Performance
Hair
Shadows
Indirect Lighting
Film
Simplify
Grease Pencil
Freestyle
Color Management
View Console
PYTHON INTERACTIVE CONSOLE 3.7.7 (default, Mar 10 2020, 15:16:38) [GCC 7.5.0]
Builtin Modules: bpy, bpy.data, bpy.ops, bpy.props, bpy.types, bpy.context, bpy.utils, bgl, blf, mathutils
Convenience Imports: from mathutils import *; from math import *
Convenience Variables: C = bpy.context, D = bpy.data
>>>
bpy.ops.mesh.primitive_monkey_add(enter_editmode=False, align='WORLD', location=(-8, -4, -4), scale=(1, 1, 1))
bpy.ops.object.shade_smooth()
bpy.ops.text.run_script()
bpy.context.space_data.params.directory = "/home/godber/"
bpy.context.space_data.params.directory = "/home/godber/Workspace/desertpy/presentations/godber-blender/monkeys.blend"
File: /home/godber/Workspace/desertpy/presentations/godber-blender/monkeys.blend/Text
Scrollbar Set Selection Scrollbar Call Menu
2.92.0


Render Window
Python Console


Render Window
Python Console
Info Window

# Demos

- Modeling
  - Source: https://www.youtube.com/watch?v=rHzf3Dku_cE
  - TODO
    - Add Material
    - Add Light
    - Add Camera
    - Render
- UI Component
  - Later Meeting
  - Source: https://www.youtube.com/watch?v=cyt0O7saU4Q

See Model Demo

# Final Model Code

```
import bpy
from random import randint

bpy.ops.object.select_all( action='SELECT')
bpy.ops.object.delete( use_global=False)

number = 500

for i in range(0, number):
   x = randint(-10, 10)
   y = randint(-10, 10)
   z = randint(-4, 4)
   bpy.ops.mesh.primitive_monkey_add( location=(x,y,z))
   bpy.ops.object.shade_smooth()
```

# Unexpected Use Cases

- zpy - blender plugin to generate synthetic 2D data (images) from 3D model for training deep learning algorithms.